file:/C:/Program Files/GridNexus1.0.2/examples/chemistry/JmolToMolStart.xml

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re:search
a journey *of* intellectual inquiry
university of north carolina **wilmington**

UNCW faculty, staff and students contribute directly to improving the ways we live and learn. Inside this issue of *re:search* you will find described the many ways UNCW brings together researchers, students and the community to solve problems facing people in Southeastern North Carolina and around the world.

A spotlight on education—from instructional technology to keeping students safe—shines brightly these days at UNCW. Our faculty is engaged in high quality educational research and evaluation including evaluating technology in public schools and whether laptops and computers can improve students' academic performance. Our faculty are studying the effectiveness of online learning methods, how music encourages cognitive development in children and the effectiveness of programs aimed at curbing school violence and anti-social behavior.

At UNCW we recognize the value of collaborative research. Faculty in several departments have joined to take a multi-disciplinary approach to studying social issues that affect us all from countering obesity to reducing violence. We are proud to announce the formation of two new research groups around the themes of obesity and violence that are pursuing research initiatives and linking their findings to real-life situations through partnering with area nonprofits.

UNCW prides itself on providing opportunities for students to be involved in research. In this issue, you'll find profiles of three superlative undergraduate researchers working with faculty mentors to study the invasive population of lionfish along the East Coast, the role of syntax, semantics and pragmatics of conditional statements in classical logic and ways to improve learning and memory. You'll also read about the Grid Nexus Project in which undergraduate computer programmers have created useful Web interfaces that are used by researchers at UNCW and across North Carolina.

We're proud that at UNCW research is collaborative, solves important problems and involves faculty and students. Take a look at this issue of *re:search*; I'm sure you'll be impressed with the breadth and value of our research activities.

Sincerely,

Robert Roer, Ph.D.
Dean of the Graduate School
and Research
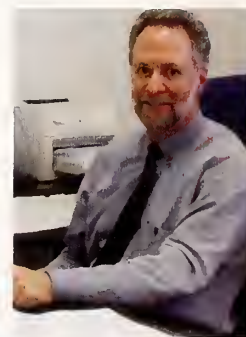
University of North Carolina Wilmington is a public comprehensive university dedicated to excellence in teaching, scholarship and artistic achievement, and service. The university seeks to stimulate intellectual curiosity, imagination, rational thinking, and thoughtful expression in a broad range of disciplines and professional fields.

Interior of the School of Education atrium during commencement, spring 2006.

UNCW/Jamie Moncrief

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Cover photo of Dr. Ron Vetter, lead Principal Investigator on the GridNexus project, taken by Jamie Moncrief, UNCW.

UNCW/Jamie Moncrief

COUNTERING THE OBESITY EPIDEMIC

The statistics are startling: 61 percent of North Carolinians are either overweight or obese. The Centers for Disease Control and Prevention estimate that medical expenditures resulting from obesity total $75 billion, and in the state of North Carolina, these expenditures total $2.138 billion annually. According to Stephen Demski, vice chancellor for public service and continuing studies, 45 percent of North Carolina's children are overweight or at risk for obesity; 59 percent of New Hanover County's population is overweight.

There is no doubt that more American adults and children are obese or overweight today, with serious personal and public health related consequences. Obesity affects both physical and mental health, social relationships and community economic productivity. Obesity can be attributed to a multitude of causes, including improper diet and lack of physical activity.

UNCW researchers are collaborating with Cape Fear Healthy Carolinians to tackle the rising problem of obesity in New Hanover and Brunswick counties. "We combine our scholarship efforts with their ability to get things done," says Demski.

The UNCW Division for Public Service and Continuing Studies and Cape Fear Healthy Carolinians recently received a $286 thousand grant from the Kate B. Reynolds Charitable Trust and a $75 thousand grant from the Cape Fear Memorial Foundation. The funds will be used to combat obesity and promote healthy lifestyle choices in children and adults in New Hanover and Brunswick Counties, with a focus on lower-income residents. According to *Moving Our Children to Healthy Weight*, a publication of the North Carolina Department of Health and Human Services, "consistent action by many different groups will enhance the quality and speed necessary to reduce

Consistent action by many different groups will enhance the quality and speed necessary to reduce childhood obesity.

childhood obesity." This is exactly the effort being undertaken by UNCW and Cape Fear Healthy Carolinians, a branch of a statewide health advocacy organization that is made up of local government institutions and non-profit organizations.

The main goal of the collaboration is to reduce the percentage of overweight and obese children. Specific projects include:

• nutrition education for home daycare providers
• community walking and fitness trails
• community garden in a local public housing development
• education campaign to inform community members about healthy lifestyle and nutrition choices
• advocacy program for changing public policy regarding health and fitness.

During each project year (of the three-year period), the needs of the lower-income obese and overweight population will be assessed regularly so that in subsequent years the initiative will effectively address those needs through the partner initiatives that are part of the comprehensive project.

UNCW brings quality research to this initiative that can be applied to community programs. "There is a great deal of obesity research going on at UNCW," says Demski. In the Department of Health and Applied Human Sciences, faculty members are conducting research on how gastric bypass affects the social and leisure activities of individuals undergoing gastric bypass surgery. Another study involves collecting data on how obesity affects worker productivity. MBA students in the Cameron School of Business are completing a social marketing practicum on how to influence the public on issues such as nutrition and fitness awareness.

• Obesity is one of the leading causes of unnecessary death in the nation.

• Obesity-related health care costs in adults reach over $100 billion nationwide each year.

• North Carolina residents are among the nation's least physically active and have one of the highest obesity rates in the nation.

sources: *American Obesity Association, N.C. Department of Health and Human Resources, and Cape Fear Healthy Carolinians*

Stephen Demski, vice chancellor for public service and continuing studies
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UNDERSTANDING VIOLENCE

"We know violence exists everywhere, but we don't understand how to affect it," says Elizabeth Demski. Demski facilitates the UNCW Violence Research Group, a group of UNCW faculty with common interests in violence research and a strong research record. "Violence is a national and local concern. The university can serve the community in helping to address it more effectively. UNCW has a cohort of faculty who have strength in this area, have been working in violence research and are now collaborating with each other," says Demski.

"One of the reasons I've been interested in studying violence is that I am a domestic violence survivor," says Dr. Kimberly Cook of the Department of Sociology and Criminal Justice. "I went to college as a formerly battered woman and a single mother. I have walked a mile in their shoes, so to speak. Also, as a sociologist, I'm very concerned about how people interpret the utility of violence as a means to achieve their goals, from spanking children to warfare; it's all connected." Cook has expanded her own research on domestic violence to include research on the death penalty, anti-abortion violence and alternatives to adjudication of violence.

The violence research group works within the local community through a variety of venues. Faculty in the Sociology and Criminal Justice Department have been studying disproportionate minority contact, which refers to the overrepresentation of minority youth in the juvenile justice system, for the North Carolina Governor's Crime Commission.

Through the Safe Schools/Healthy Student Initiative,

Dr. Caroline Clements, psychology, is compiling broad data about the behaviors of teens in New Hanover County. The group is also associated with Healthy Carolinians, a statewide health advocacy organization. Cape Fear Healthy Carolinians, which serves New Hanover and Brunswick counties, is a consortium of community organizations, including nonprofit groups, schools, hospitals, organizations such as the Domestic Violence Shelter, and the campus and county police. "Healthy Carolinians hopes to improve violence prevention efforts by engaging neighborhood leaders, churches and minority groups with influence in their arenas to reach populations we may not otherwise have access to," notes Demski. "We want to pull in people who haven't been in the conversation."

Members compile and share local data to extract valuable information for each of their disciplinary fields. In addition, the varying perspectives on their individual data gathering provide opportunities for interdisciplinary research. "We are currently sharing data to write a series of collaborative working papers and publications," says Demski. Furthermore, as the group develops stronger international ties, members plan to do comparative research with similar population groups around the world to gain insight into cultural differences and how they affect violence patterns.

In addition to Cook, Clements, and Demski, the Violence Research Group includes Dr. Adrian Sherman, assistant provost for international programs, Dr. Mike Maume of sociology, Dr. Susan Bullers, director of UNCW's Women's Resource Center, and Dr. Yeoun Soo Kim-Godwin, of nursing.

Elizabeth Demski, director of grant development
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IPODS AND XYLOPHONES

Dr. Daniel C. Johnson, assistant professor in the Department of Music, studies different ways of teaching music that foster students' critical thinking skills. Two particular research projects exemplify his research linking music instruction via technology enhancements.

In an on-going research study involving approximately 200 UNCW undergraduates in a basic studies course he designed, Johnson is investigating the effect of extracurricular music listening assignments on students' abilities to describe music. Using preliminary results from this study, Johnson demonstrates that repeated music listening using iPods results in significantly enhanced abilities to describe unfamiliar musical examples.

Johnson is also a nationally certified teacher-trainer in the Orff-Schulwerk approach to music and movement education. This innovative pedagogy focuses on creative and critical thinking and is based on what children do naturally, such as sing, chant and dance. Closely allied with learning language, this approach highlights the experience of making music before the formal reading and writing of music, also known as "sound before sight." The focus is on interactive and participatory experiences such as moving, chanting, singing and playing instruments (xylophones, glockenspiels, drums, etc.) This approach is based on the work of Carl Orff, a German composer and music educator. Through this process, Johnson reinforces the many ways that music is intrinsically connected to literacy and language development.

Johnson employs the Orff-Schulwerk approach when teaching music to about 100 predominantly Hispanic elementary school children in after-school programs at two New Hanover County schools. Johnson's instruction is part of the OLAS and ASPIRE programs, two federally funded 21st Century Learning Grant projects. In addition, he directs the Orff-Schulwerk Program at UNCW and offers in-service training and certification courses for area music teachers throughout the year. Anecdotal results from this on-going project include very positive parent, teacher and student feedback. Statistical analyses of achievement data are in progress.

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Tracy Hargrove

A principal and student work together at a North Carolina 1-2-1 grant-funded elementary school.

LEARNING WITH LAPTOPS

Research suggests that when students have access to a personal computer, they are more motivated to learn and academic achievement increases. Drs. Tracy Hargrove, Kathy Fox and Kathleen Roney, of the Department of Curricular Studies within the Watson School of Education, are conducting an external review of the North Carolina 1-2-1 grants for the North Carolina Department of Public Instruction. Dr. Hargrove serves as principal investigator of the project. The NC 1-2-1 Program is a one-year grant program, funded through a No Child Left Behind Enhancing Education Through Technology grant. The group began work on the review in August 2005.

The 1-2-1 grant is based on the premise that an improved teaching and learning climate, increased student motivation and

The goal of the NC 1-2-1 program is to prepare students to enter the world of higher education and work with a history of technology literacy and academic success.

higher student achievement occur when each student has access to a personal computer for his or her own use throughout the school day or during a specific class or course of study. These grants have provided additional hardware to each school so that the participating grade level either has one computer for every student or one computer for every two students. This study is designed to measure both motivation and academic achievement.

The goal of the NC 1-2-1 program is to prepare students to enter the world of higher education and work with a history of technology literacy and academic success. Four elementary schools in North Carolina were awarded 1-2-1 grants. Each school was assigned an external evaluator—Fox, Roney or Hargrove—who visits four times during the school year.

Hargrove, Fox and Roney are using quantitative and qualitative measures to evaluate the success of the grants over a three-year period. Quantitative measures include the administration of a variety of standard instruments. Qualitative data is being gathered via student and teacher self-report as well as on-site observation by researchers. The hypothesis to be tested is that the integration of technology into instructional practice will make a significant difference in student achievement, attitudes, values and behaviors.

"We are collecting the same quantitative data from four comparison schools. Each school receiving grant money was matched to a comparison school. Schools were matched by controlling for a number of demographic variables including school size, and the percentage of students in various categories identified by No Child Left Behind such as ethnicity, socio-economic status and English proficiency," notes Hargrove. Environmental factors, including principal's leadership style and school population characteristics will also be considered. Leadership style instruments will be used to assess whether a principals' leadership style influences the success of technology programs. This study also examines the effect of school technology programs on the utilization of technology in the home. Parents will be asked to complete a survey twice each year, and a sample of parents will participate in an interview.

"We have not finished collecting or analyzing quantitative data, but qualitative data suggest that students are more motivated to engage in academic activities and are developing a more positive attitude toward learning," says Hargrove.

Tracy Hargrove, Ph.D., curricular studies
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Elementary school students in NC 1-2-1 grant-funded programs have access throughout the day to laptop computers equipped with Internet access and appropriate software. Research suggests that these students are more motivated to learn, and their academic achievement improves as a result.

Tracy Hargrove

STOPPING SCHOOL VIOLENCE

Dr. Caroline Clements, associate professor of psychology, has a big job: she serves as project evaluator for a $9.5 million Safe Schools/ Healthy Students (SSHS) federal grant project awarded to the New Hanover County School System in coordination with other community groups. Not to mention that she serves as director of the UNCW Center for Teaching Excellence. Not to mention that she's been known to teach classes on top of everything else. "My life is very busy," sighs Clements.

The SSHS initiative provides grant funding to New Hanover County schools and community groups so they can implement proven programs and services that promote healthy childhood development, violence prevention, and alcohol and drug use prevention among school-age children. The federal program, which began in 1999, has distributed funds to more than 90 school districts around the country. Then-president Clinton established the grant program in the hope that it would reduce the likelihood of incidents of school violence, particularly in response to the Columbine shootings in 1999.

In 2003, New Hanover County Schools, in collaboration with the New Hanover County Sheriff's Department, the Southeastern Center for Mental Health Services, and 27 other community groups, formed the Uniting for Youth Initiative. The initiative received the $9.5 million grant in 2003, and is funded through 2007. The group's goals include improving safety and security at county schools and daycare centers; increasing parental involvement; preventing violence in the home, schools and within the community; preventing drug and alcohol use among minors; and improving the mental health of the 21,000 students served by New Hanover County Schools.

One of the main goals of the project is to teach children positive social skills. New Hanover County received one of the largest grants *ever* awarded by the SSHS Initiative; other school districts usually receive somewhere between $1 and $2 million.

"New Hanover County is a disproportionately violent county. It is one of the more violent counties in North Carolina. It has the highest rate of foster care placement in the state, and is among the highest in teen and domestic violence rates," says Clements. She attributes some of the problem to a high rates of drug abuse among county residents and to the socioeconomic woes that community members face in an area where the divide between the rich and poor is growing.

Yet, the SSHS initiative has been shown to positively affect social behavior among young people. "Violence rates, in general, are decreas-

> ## "Violence rates are decreasing around the country...rates are decreasing at a faster rate in Safe Schools/Healthy Students grant-awarded schools."

ing around the country. Violence rates are decreasing at a faster rate in SSHS grant awarded schools," says Clements.

"Every student in New Hanover County is affected by this grant," notes Clements. The grant supports programs that focus on social skills training in pre-K through fifth grade, alternatives to suspension, mental health support in schools, teen leadership experiences, peer mediation training and a youth court in which students participate in model judicial hearings and try their classmates for minor offenses.

Clements coordinates the evaluation of all of the programs, and her team documents the effectiveness of the programs twice a year. She employs a full staff: three full-time employees, three graduate students and a part-time Ph.D. student. "We generate tons of data," says Clements, "We go over all of the agencies to see what steps they've taken and what improvements have been made. Kids' behavior should improve over time."

Clements and her evaluation team also survey 28,000 children, parents and school personnel each year to assess school security. The schools administer the surveys and Clements and her team interpret the results.

All of the programs implemented by the initiative are evidence-based, meaning that there is published data showing that the programs are indeed effective. Clements continually evaluates the effectiveness of the programs to show that they are still working. "We only use what we know is effective, and we continually evaluate it. We only want programs that work," says Clements. The goal is to identify children in the most need of service, yet all are affected. "The focus is on prevention rather than remediation," says Clements.

Lisa Brewster, SSHS project director in the New Hanover County Schools, says, "The evaluation department is one of the best parts of this grant. The ongoing evaluation is tremendous, just so we know where we stand." For her part, Brewster has learned a lot through working with researchers at UNCW and believes that the learning relationship is mutual, "I've learned a lot about evaluation, and they've learned a lot about schools," she says.

Clements' evaluation team has also performed assessments of county school security. They sent mock-intruders into the schools, unannounced, to see when and if the intruders would be recognized. "We have seen an improvement in this area, most schools are more aware of safety concerns," says Brewster.

For more information, visit www.nhcs.k12.nc.us/sshs/.

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A TEACHER'S COMMITMENT

As a special education teacher in her native Iran, Dr. Mahnaz Moallem strived to become a better teacher. This dedication to teaching drove her to further her education in Iran and later at Florida State University, and it is what drives her research in instructional methods and technology as a professor of instructional technology at the Watson School of Education. "I am deeply committed to human development, and fortunately my work has allowed me to pursue this passion," says Moallem.

Moallem's research focuses on how people learn and how to incorporate non-traditional methods of learning into a Web-based approach to teaching. Her research also has a strong international focus. Her research interests include instructional design models and principles, development of Web-based instructional materials, design and development of online collaborative learning environments, and how new and emerging technology can improve learning and instruction.

She is involved in two research projects and recently applied for a grant from the National Science Foundation with a group of computer science faculty and officials from three local school systems. The group plans to begin a three-year program to encourage students in New Hanover, Pender and Brunswick counties to study science, technology, engineering and math (STEM) by offering expanded information technology programs to students and teachers in grades 7 through 12. The goal of the program is to teach students and teachers how to exploit the Squeak Media Authoring Tool—a free open source computer-programming tool—as a modeling environment to infuse technology skills into core STEM curriculum.

One of her other research projects grew out of her own experience in teaching online courses. "I confronted issues when I started teaching online courses. Students had different styles of learning, and it was difficult to keep non-traditional students in online courses. Non-traditional students found that although online courses are convenient, they didn't match their learning styles," says Moallem. She has since spent the last two to three years developing instructional strategies that address the needs of non-traditional learning and is studying how online learning differs from traditional classroom-style learning.

In December 2005, she visited the Philippines and Taiwan and presented her study on different learning styles in an online environment. In June, she met online with researchers from both places to begin a study comparing online learning styles of students from the Philippines, Taiwan and the United States.

She is also working to partner Wilmington science teachers with science teachers in New Zealand. She's initiated a pilot program for students to collaborate with one another online and for the participating science teachers to compare teaching methods and set up similar goals.

Dr. Mahnaz Moallem, left, conducting a workshop for teachers and faculty in the Philippines.

courtesy of Mahnaz Moallem

Mahnaz Moallem, Ph.D., specialty studies
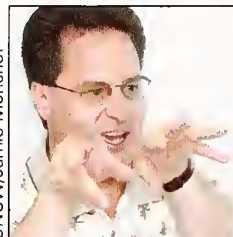moallemm@uncw.edu

student research

"UNCW has a long history of involving students in research in a variety of disciplines. Because we are a smaller university, we can give undergraduates the chance to become colleagues in their departments. We do not only involve graduate students in research. Our faculty sees mentoring students as a part of research and scholarship. Our faculty provides a lot of one-on-one mentoring, and we do it without a lot of infrastructure," says Dr. Kate Bruce, director of the Honors Program and psychology professor. Dr. Bruce helped organize the Center for Support of Undergraduate Research and Fellowships (CSURF). CSURF is a resource to coordinate opportunities and information related to undergraduate research and scholarship.

For more information about CSURF or the Honors Program, please contact Dr. Kate Bruce at bruce@uncw.edu.

Tera Lynch works under Dr. Sridhar Varadarajan's supervision. In chemistry his lab, students design and investigate cytotoxic compounds that can be targeted to specific cells. Such compounds have potential applications in diabetes and cancer therapy. Experience like this can help define a student's career.

Grid computing is one of the newest and most intriguing areas in the computational sciences. UNCW is one of four institutions statewide leading research teams to investigate grid computing and its applications.

GRIDNEXUS
TRUE COLLABORATION

Dr. Ron Vetter, Grid Nexus Principal Investigator.

In a 2003 study sponsored by e-NC, Dr. Robert Cohen, a fellow at the Economic Strategy Institute of Washington, D.C., estimated that grid computing would give a $10 billion boost to North Carolina's economy through 2010. He predicted that the development of grid technology would lead to an additional 24,000 jobs and $7.2 billion in personal income in the state. Dr. Cohen notes that the emergence of grid computing depends upon the widespread availability of broadband Internet access across the state and "a sufficient pool of skilled computer and communications professionals to fully deploy and utilize the new technologies and applications."

Grid computing is one of the newest and most intriguing areas in the computational sciences. UNCW is one of four institutions statewide leading research teams to investigate grid computing and its applications. Computer science researchers and programmers are integrating their knowledge of the complex workings of the grid system into a user-friendly graphical interface that makes grid technology more accessible to scientists and researchers.

"Anyone who has large storage or computational needs should think about a grid," says Dr. Ron Vetter, professor of computer sci-
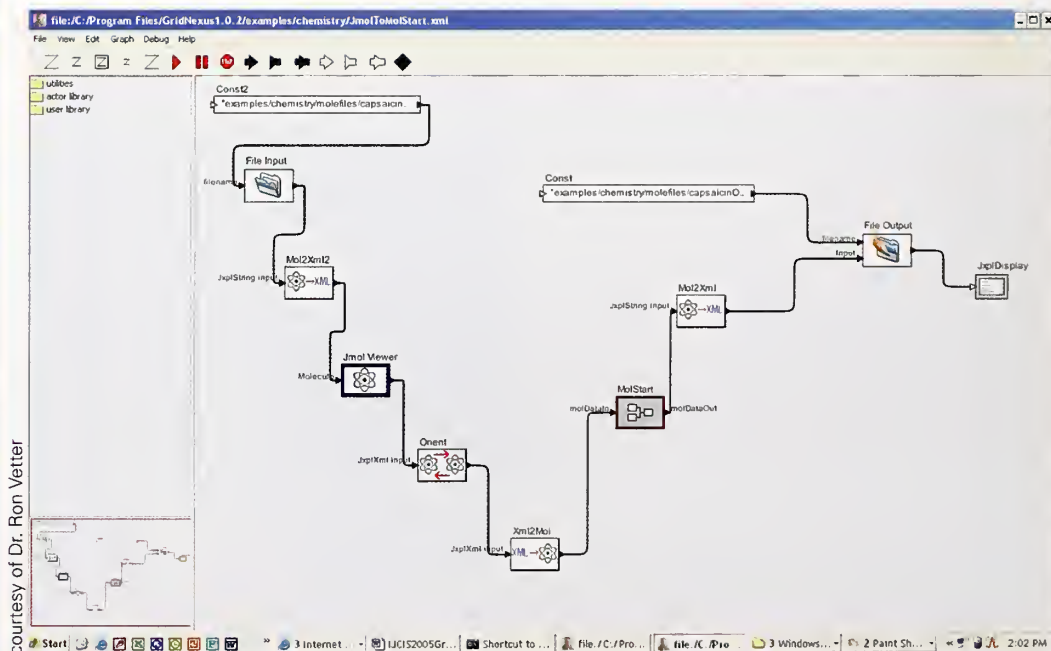
A GridNexus workflow.

ence at UNCW and lead principal investigator (PI) on the GridNexus project. A grid network applies the resources of many computers interconnected by a network to a single problem. This could be a research question that requires a large amount of processing capability and data storage ability. "People sometimes say utility computing to refer to grid computing, like electric utility or a sewer utility," says Dr. Vetter. "The idea behind grid computing is that users should be able to just plug their computers into the wall and utilize the capabilities of the grid to solve their computing needs. The grid can be used for computing and to actually solve problems but it can also be used for storage. Part of the grid's job is to create a uniform platform to process and store data." A grid takes many machines, even several thousands, and makes them all look like one computational resource. Before grid computing, a researcher would need a very expensive supercomputer with vast computational and storage abilities to perform serious research, whereas now, many machines—of differing ages, capabilities and platforms—can all be combined to look like one computer.

Interacting with grid services can require the user to type cumbersome commands, and this lack of a user-friendly interface prompted researchers within the UNCW Grid Computing Team to create a relatively simple graphical user interface. This interface, called GridNexus, is easy-to-use and is comparable to the way a browser provides a way to visualize and use the World Wide Web.

The GridNexus project, funded through December 2006 by University of North Carolina General Administration, is a multidisciplinary and multi-institutional project with UNCW in the lead. Other UNCW co-PIs include Dr. Clayton Ferner, Dr. David Berman and Dr. Tom Hudson of computer science; Dr. Bob Tyndall and Mr. Bobby Miller of information technology systems; Dr. Jeff Brown of mathematics and statistics; Dr. Ned Martin of chemistry; Dr. Ann Stapleton of biology; Dr. Tom Janicki of information systems and operations management; and Dr. Woody Hall of economics. A host of undergraduate students, who are now in graduate school, performed invaluable computer programming services for the GridNexus project. Collaborating institutions include North Carolina State University, Western Carolina University, North Carolina Central University, East Carolina University and Cape Fear Community College.

The student programmers created interfaces to assist researchers in the fields of combinatorial mathematics, computational chemistry, business computing and bioinformatics. These programs make the researchers' jobs easier, letting researchers focus on their research and helping them evaluate vast amounts of data.

"If you take undergraduate students in computer science and information technology who can program and put them with research scientists who cannot program but have computational and storage needs, let them partner and they'll build wonderful little tools," says Dr. Vetter. The GridNexus project partners faculty researchers with undergraduate student programmers who then develop system tools as part of the user interface to complete a variety of tasks. An

Tristan **Carland**

"For me, the project was originally just a really neat job. I got to actually use the stuff I had learned in a few of my classes, and I got to call myself a student research programmer.

"I started to handle the bioinformatics concerns of Dr. Ann Stapleton. Bioinformatics is the new rocket science, and Dr. Stapleton is sharp enough to have interests in most every facet of it.

"My time with Dr. Stapleton was terribly invaluable. I find that this experience prepared me for my current graduate school experience quite thoroughly. Walking into the gray world of science and coming out with something in-hand is the hardest thing a student can face, and my time with her certainly brought me to terms with the art of it.

"The wisdom of Dr. Ann Stapleton, the forward-thinking of Dr. Ron Vetter, the help of Dr. Clayton Ferner, and the attitude of Dr. Jeff Brown are what turned me into the marine genomics Ph.D. student that I am today."


courtesy of Tristan Carland

Former student programmer Tristan Carland, now a doctoral student at the Scripps Institution of Oceanography in San Diego.

interdisciplinary faculty and student research team have collaborated to create several GridNexus applications over the last two years.

"Biologists need to focus on analysis and interpretation of data rather than on details of the programming required to run computing-intensive methods. The GridNexus software provides a nice solution to handling the details of computer-intensive processing; I expect this to make intensive data analysis more widely used as a part of biology," says Dr. Stapleton.

Dr. Martin has been working with student programmers who have created GridNexus modules that make his work in computational chemistry much less cumbersome. Much of his work involves sending data to a remote computer location, yet before sending the data, it has to be converted into a certain format. "The old submission of a remote computation job used to take about 15 steps and now it takes three, simpler ones at that. The computer science

courtesy of Dr. Ron Vetter
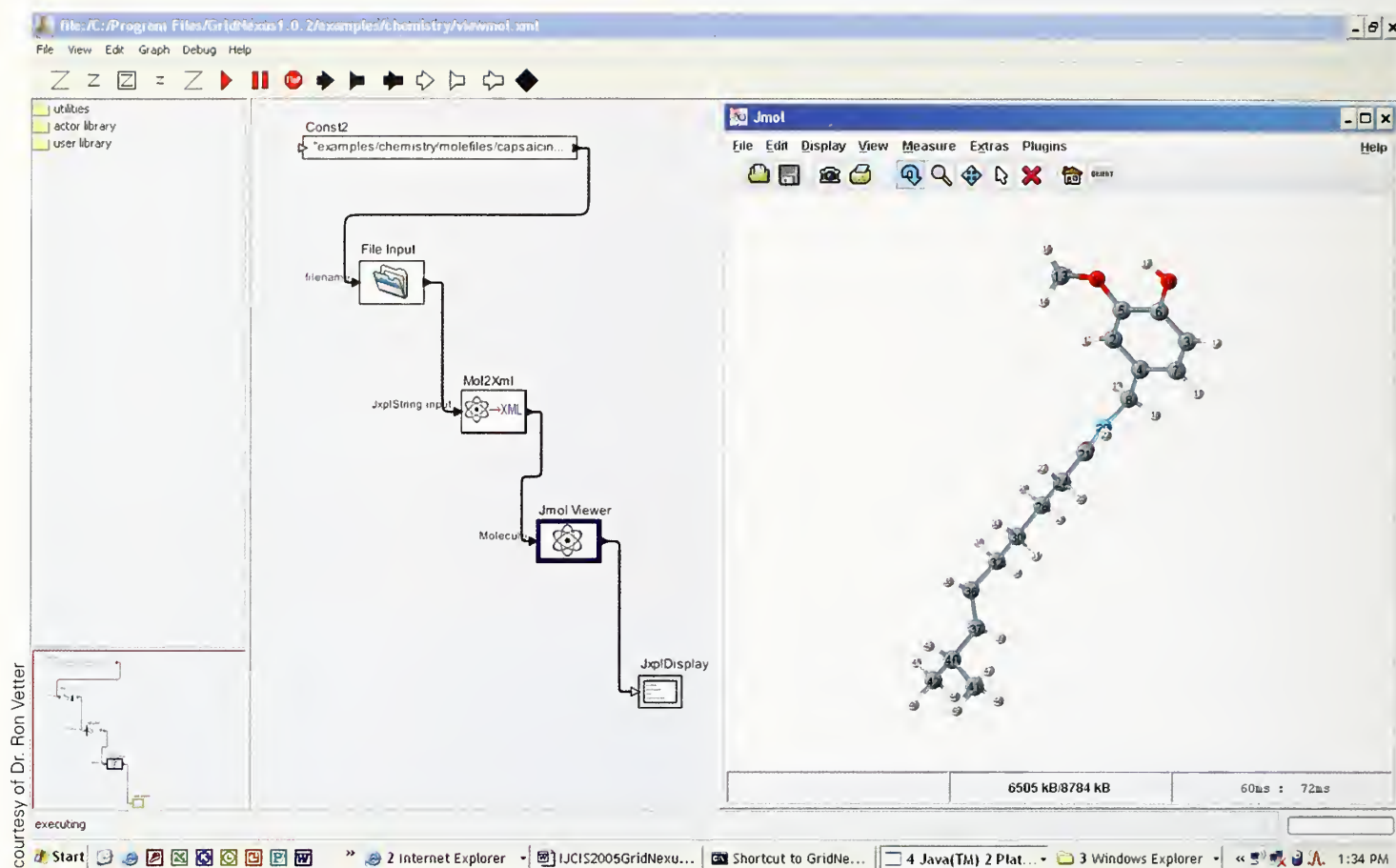
Molecular chemistry workflow in GridNexus.

students have made that process much easier through grid modules," says Dr. Martin.

"Previously, certain processes would require the use of several programs, as well as hand-written calculations, to finally reach the final calculated results. With the modules I've helped create, all these tasks can be performed with one push of a button," says Andrew J. Martin, a computer science graduate student at UNCW who worked on the project as an undergraduate.

Furthermore, the modules are reusable and accessible to a variety of researchers over the network. "I really like the idea of the students' programming being reused, instead of having them write scripts that are then discarded. In the long run this will reduce duplication in effort too," says Dr. Stapleton.

> ❝ **If you take undergraduate students who can program and put them with research scientists… they'll build wonderful little tools.** ❞

One of the most important outcomes of this program is that all of the undergraduate student programmers involved in the project have gone on to graduate school, according to Dr. Vetter.

The group of students and faculty published "GridNexus: A Grid Services Scientific Workflow System" in the *International Journal of Computer and Information Science* June 2005. "Most of the authors of the paper are students. As an undergraduate student, what is the likelihood of having a journal article published?" asks Dr. Vetter.

Dr. Vetter notes that the next step is finding more funding—now that the GridNexus's basic infrastructure has been developed—to grow the user base. The GridNexus software is free and available for anyone to use.

As Dr. Cohen predicted, grid computing will most likely grow and become part of the core cyberinfrastructure in the future. Computer science researchers and undergraduate programmers at UNCW are doing their part in making this infrastructure more user-friendly and available to a wider group of users.

For more information, visit www.gridnexus.org.

> " I have had wonderful research experiences that have satisfied my passion for science, and expanded not only my mind, but also my social networks building connections to future mentors and collaborators. "

UNCW/Jamie Moncrief
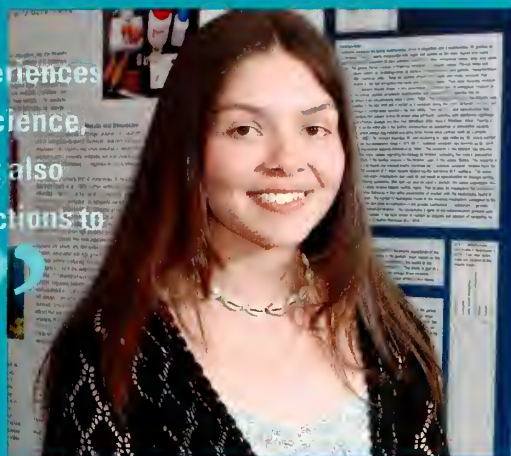
REBECCA HAMNER
STUDENT RESEARCHER & FULBRIGHT SCHOLAR

As an 11-year-old, Greensboro native Rebecca Hamner loved the ocean and knew she wanted to study marine biology. She came to UNCW with this intention and recently graduated with degrees in marine biology and psychology.

While at UNCW, her academic interests have widened and shifted with various research projects she has pursued in conjunction with faculty. Her research includes four years of bottlenose dolphin surveys along the coast of southeastern North Carolina with Dr. Laela Sayigh. "During surveys, I collected data on environmental conditions and dolphin behaviors and photographed dorsal fins for photo-identification," says Hamner.

As a freshman, she began working with Dr. Craig Bailey at the Center for Marine Science, at which time she learned molecular genetic techniques to identify microalgae.

She has also worked with Dr. Wilson Freshwater of the Center for Marine Science. "My work with Dr. Freshwater over the past three years has been an incredible learning experience involving the use of molecular genetic tools to investigate a variety of topics. I got my feet wet—sometimes quite literally—by assisting with several marine algae projects. These included a study on an invasive *Gracilaria algae* and phylogenetic analyses of the genus *Asteromenia*, both of which earned me a place as co-author on the resulting publications," notes Hamner.

This project led to more opportunities. "Soon after I started in the lab, the opportunity arose to study the invasive population of lionfish along the East Coast, and this has been my main focus ever since. I used mitochondrial DNA to investigate how many species of lionfish are invasive to the Atlantic, the extent of the genetic bottleneck that accompanied the invasion, and the likely source population of the invasive lionfish. In November of 2005, I defended my honors thesis entitled "Genetic Analyses of Lionfish: Venomous Marine Predators Invasive to the Western Atlantic." "Dr. Freshwater and I are currently preparing a manuscript that will soon be submitted for publication," describes Hamner.

Hamner has had an exceptional experience at UNCW. "From my experience, UNCW is a great place for undergraduate research! I think it is wonderful that students are encouraged to work one-on-one with professors, and that we are able to take advantage of this valuable opportunity from the time we are freshman," says Hamner, "All of the faculty members that I have worked with at UNCW have made significant contributions to my education and my future plans."

Hamner continued her research this summer as a research assistant for the Male Dolphin Alliance Project in Shark Bay, Western Australia.

Hamner will then continue her research as a Fulbright Scholar in New Zealand. "I will use molecular genetic techniques to investigate issues related to the conservation of Hector's dolphin, *Cephalorhynchus hectori*, and a recently recognized subspecies, Maui's dolphin, *Cephalorhynchus hectori maui*. These endangered dolphins are endemic to the waters surrounding New Zealand and are subject to the effects of human interactions and disturbances. In addition to my genetic work, I hope to learn more about the interactions between the local people and these dolphins," notes Hamner.

"My research experience at the university has given me confidence that I will succeed in the pursuit of my goals," notes Hamner, "I have had wonderful research experiences that have satisfied my passion for science, and expanded not only my mind, but also my social networks building connections to future mentors and collaborators."
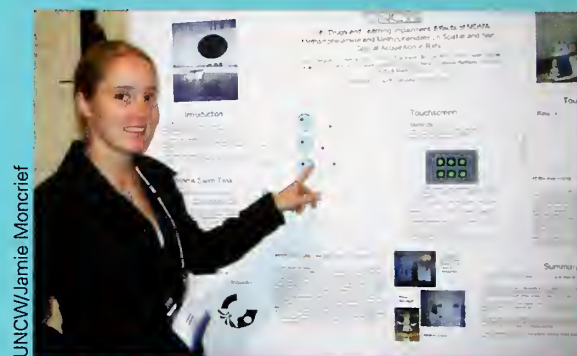
MATTHEW SAYBALL
IN HIS OWN WORDS

2006 graduate Matthew Sayball is concerned with conditionals. Below, the budding philosopher describes his departmental honors project in philosophy:

In our daily lives, conditionals are commonly used in communication, in decision-making, and in drawing inferences. Though even children understand conditionals and use them on a daily basis, philosophers see conditionals as the source of several thorny issues. Over the last 50 years, philosophers of language and logic have produced massive amounts of literature on conditionals, and the issues involved continue to receive much scholarly attention today.

My project is focused on the syntax, semantics and pragmatics of conditional statements in classical logic, modal logic and ordinary English. The major issues that I take up include the classification, the interpretation of conditionals and the meaning of conditional connectives like "if." I also examine the ways in which conditionals are and can be used to draw valid inferences.

A conditional statement like "had I known yesterday what I know now, today would be different" certainly seems meaningful. What is its meaning? Can it be considered as true? What might the conditions be that make it true? If it cannot be understood in terms of truth, how can it be understood?

My project seeks to present, evaluate and respond to the major views on these issues. This undergraduate research opportunity has enabled me to work independently on a fertile contemporary subject with a highly-qualified adviser, Dr. Ferenc Altrichter, and offers me an authentic taste of what it is like to be a professional academic. Thanks to the Honors Program, the first-rate education in philosophy that I have received at UNCW has been enhanced in ways that I could have never predicted.

Matt Sayball had the opportunity to discuss his research with members of the UNCW Board of Trustees.

CAROL DWAN

Carol Dwan's family background had a major influence on her academic studies. "I grew up in the suburbs of Washington, D.C. My mother was a social worker and my father a physician, and I grew up hearing about medicine and psychology, which translated into my two majors of biology pre-med and psychology with chemistry minor," says Dwan. Dwan graduated in 2006 and now attends medical school at the University of Maryland. Besides completing her academically demanding double major at UNCW, she received her EMT certification in 2005 by taking night classes at Cape Fear Community College in Wilmington. Despite her busy schedule, she has also volunteered her time answering the crisis phone line at Coastal Horizons, a local substance abuse treatment center.

Dwan researched learning and memory in rats with Dr. Mark Galizio of the Psychology Department. "My honors project work examined the effects of a new drug—a benzodiazepine inverse agonist with selective affinity for the a5 GABA receptor subtype. What this means is that the drug binds to the GABA receptor in the brain but has the opposite effects of benzodiazepines like valium. Instead of putting you to sleep and making you forget, an inverse agonist may enhance memory but cause seizures. That's where the 'selective affinity' part comes in. This drug shouldn't bind to motor cortex, only to the hippocampus, which is a memory center in the brain. So in theory, this is what we're testing, the drug should improve learning and memory but not cause seizures or anxiety," says Dwan.

About her time at UNCW, Dwan is nothing short of positive. "Undergrads get to be involved in every part of the process of research, and the professors are very accessible. At medical school interviews, people were very surprised to hear how involved I'd been with my research. Dr. Galizio has been a huge mentor for me. Dr. Katherine Bruce [of psychology] has also provided so much support and so many opportunities outside and inside the classroom that I think I would have had a much less colorful, enriching experience here without her guidance," says Dwan, "I think doing research has really enhanced my time here. It's like getting away from textbooks about things and finally experiencing them up close."

TECHNOLOGY TRANSFER, ECONOMIC DEVELOPMENT AND THE PUBLIC GOOD

University research plays a major role in contributing to economic development. University laboratories initially developed six out of the 10 most prescribed pharmaceuticals. Software giant SAS started out on a university campus. University I.T. researchers developed several of the early Web search engines, most notably Lycos. The popular sports drink Gatorade originated in a university laboratory.

These blockbuster successes, as well as their numerous, less dramatic counterparts, almost always require a commercial partner to develop them beyond proof of concept and to bring them into the competitive world marketplace. University discoveries and inventions are rarely "turnkey" commercial methods or products.

Because of the critical nature of commercial partnerships between business interests and university know-how and technology, the absence of commercial partners limits the economic development potential of university research.

One of our top priorities at UNCW is identifying regional economic partners to expand upon our developing technologies. We encourage entrepreneurs to consider creating potential partners with UNCW researchers in those areas where business partners do not exist. We do this through both on-campus and off-campus efforts, and happily can report a number of new company formations around UNCW technology and know-how, such as Seahawk Software, Blue Ocean Organic Seafood and Ligands for Imaging. We can also report spontaneous company formation endeavors involving local entrepreneurs and research faculty, such as Cape Fear Mariculture and World Ocean Solutions.

Our on-campus efforts center on leveraging the expertise and community presence of UNCW's Cameron School of Business to help define company formation opportunities around UNCW technologies and to identify entrepreneurs to lead company formation efforts. This year, three selected MBA students are receiving academic credit to 1) assess the commercial feasibility of certain UNCW technologies, 2) prepare a business plan for launching a company based on the technology, and 3) present the business plan to regional angel investors for funding.

One of the MBA students has prepared a business plan for land-based commercial farming of saltwater finfish based on methods demonstrated at UNCW and utilizing equipment developed by NC State. A second MBA student has prepared a business plan for a company that will market software to institutions of higher education and can be a first-option commercial partner for both the computer science and ITSD departments. A third MBA student with a chemical engineering background has prepared a plan to create a local company that will develop and/or license a UNCW chemical technology with applications in medical imaging and environmental remediation. All business plans were presented to regional angel investor groups in the late spring and early summer 2006. Each student intends to create and lead the company through its early stages, provided sufficient funding.

Our off-campus efforts focus on establishing high visibility within regional organizations such as the Council for Entrepreneurial Development and the Wilmington Investor Network. These organizations attract experienced entrepreneurs and investors looking for additional opportunities. We have found that these individuals have a high level of interest in UNCW's research, discoveries and inventions.

One goal of these partner-creation activities is for the community of potential partners to grow and thrive to the point in which local partners exist for most of the university's major research efforts. Recently, a Wilmington entrepreneur formed a company to function as a marketing partner for certain UNCW marine science laboratories that routinely generate surplus research organisms. The company markets the research organisms to other research entities and returns a large share of the proceeds to the labs to fund further research.

Economic development based on university technology is a win for everyone involved. It enables dissemination of the results of academic research reaching into people's daily lives far beyond traditional academic channels. It feeds employment opportunities and gives birth to new companies and an occasional new industry, a tremendous return on taxpayer investment. Nevertheless, a university's technology transfer capabilities are only part of what it takes to make economic development happen. Regions and states also need commercial partners for university technologies and know-how.

Ronald Podraza, J.D., director of technology transfer
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Dr. Robert Boyce, far right, with undergraduate student researchers, from left: David Mills, Josh Bolton and Brian Cioci.

courtesy of Dr. Robert Boyce

SHAPING UP THE WORKPLACE

Dr. Robert Boyce, along with students in the Department of Health and Applied Human Sciences, utilizes innovative techniques to improve the lives of workers, while at the same time increasing productivity and reducing insurance costs to industry. Boyce works closely with Dr. Edward Boone of the Mathematics and Statistics Department, and with students Brian Cioci, Josh Bolton, David Mills and Albert Lee. Boyce blends the disciplines of exercise physiology and ergonomics in an effort to reduce the effects of sedentary occupations on workers.

Most recently, Boyce and his students conducted a survey of 400 employees at Verizon Wireless's home office in Wilmington. They collected data regarding employee body discomfort, fatigue, diet, exercise, body fat and injury profiles. This study is scheduled to be published in the journal *Medicine and Science in Sport and Exercise.*

This is the first phase of a more extensive effort that examines how these factors influence employee productivity and related health-insurance costs. Boyce's ultimate goal in pursuing this research is to be able to quickly identify the physical needs of employees in a variety of industries and thus meet their needs through utilizing exercise, ergonomics and nutritional interventions.

Boyce is particularly proud of his student participation. His students, in turn, benefit from their participation in research projects, and from attendance and presentations at regional and national conferences, such as the annual conference of the American College of Sports Medicine.

Boyce has over 30 years of experience in the field, and he serves as a fellow in the American College of Sports Medicine. His related projects in occupational physiology investigate a variety of other industries. He is the founder and former director of the Occupational Physiology Research Group in the American College of Sports Medicine. This group consists of an international forum of scientists studying physically demanding occupations, such as the military and police.

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